

## **Remarks**

Applicants herein affirm the election made by phone on August 12, 2003, to prosecute the invention of group I, claims 1-22 and 35-39, without traverse. Claims 23-34 will be cancelled without prejudice from the instant case upon indication of allowable subject matter in the remaining claims.

Claims 1, 3-22 and 35-39 are pending currently. To facilitate prosecution, claims 1, 8-11, 20-22, 35, 38 and 39 have been amended to recite a specific organic catalyst, namely, a metallocene catalyst. Claims 3 and 12 have been amended to correct the dependencies thereof. Claims 13-16, and 39 have also been amended to correct certain informalities identified by the Examiner. No new matter has been added.

### **I. THE EXAMINER'S OBJECTION TO THE ABSTRACT IS OBTIATED**

The Examiner objected to the abstract of the disclosure "because it lacks the general method of claim 1, instead focusing on the narrower method of claim 35, and it uses the incorrect term 'supercritical-like solvents'; c.f. below." (Office action dated August 25, 2003, paragraph 6). The Examiner required correction.

In reply, although applicants believe that the abstract as originally filed meets all requirements under section 608.01(b) of the MPEP, nevertheless applicants have amended the abstract to more closely track the language of original claim 1. Applicants note that the abstract still includes the term "supercritical-like solvent" since, contrary to the Examiner's assertion, such term is clearly definite and properly used as explained below in response to the Examiner's rejection of such term under 35 U.S.C. section 112, second paragraph. In light of the above amendment and the comments herein below with regard to the term "supercritical-like solvent," the Examiner's objection to the abstract is obviated.

### **II. CLAIMS 1-22 AND 35-39 MEET ALL THE REQUIREMENTS OF 35 U.S.C. SECTION 112, SECOND PARAGRAPH**

The Examiner rejected claims 1-22 and 35-39 under 35 U.S.C. section 112, second paragraph for being indefinite with respect to a number of terms in the claims. Each of these rejections is addressed below.

#### **A. THE TERMS "SUPERCRITICAL-LIKE SOLVENT" AND "SUPERCRITICAL SOLVENT" ARE DEFINITE**

With regard to the term "supercritical-like solvent" the Examiner asserted:

[i]n claims 1, 5, 6, 8-11, 17-20 and 37, it is not clear what property makes a solvent “supercritical-like”. Indeed, the term “supercritical solvent” is a misnomer since it is not a particular property of the solvent alone which makes it supercritical, but the particular temperature and pressure at which the solvent is held in its phase diagram which makes it be in the “supercritical state”. Claim 5 appears to recognize this fact much more clearly. Also see the general teachings of the McLaughlin reference. (Office Action of August 25, 20003, page 4, paragraph 7).

The Examiner further asserted on page 5 of the Office Action that in claim 35, and also in claim 38, step f, the term “supercritical solvent” is a misnomer.

In reply, applicants respectfully submit that the term “supercritical-like solvent” is clearly defined in the specification and is definite under 35 U.S.C. section 112, second paragraph. In addition, the term “supercritical solvent” is a term well defined and understood in the art to refer to a solvent in its supercritical state. Because it is well-recognized that applicants are their own lexicographers, MPEP 2173.01, and that the “[d]efiniteness of claim language must be analyzed, not in a vacuum, but in light of: (A) The content of the particular application disclosure; (B) The teachings of the prior art; and (C) The claim interpretation that would be given [by one of ordinary skill in the art]” (MPEP 2173.02), the terms “supercritical-like solvent” and “supercritical solvent” are definite as used in the present claims. “If the scope of the subject matter embraced by the claims is clear, and if applicants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims, then the claims comply with 35 U.S.C. 112, second paragraph.” MPEP 2173.04.

Here, the term “supercritical-like” is defined on page 3, lines 4-6 of the application to refer specifically to “a solvent in its supercritical state and also . . . to any subcritical liquid solvent having a boiling point below about 16°C at atmospheric pressure.” Thus, contrary to the Examiner’s assertion, the present specification makes clear what properties make a solvent supercritical-like – it is either in its supercritical state, or has a boiling point below about 16°C at atmospheric pressure and is in a subcritical state. One of skill in the art would obviously and clearly be able to determine if a particular solvent was either (a) in its supercritical state, or (b) was a solvent, with a boiling point below about 16°C at atmospheric pressure, in a subcritical state. Thus, the scope of the term “supercritical-like solvent” is readily determinable by one of skill in the art and is therefore definite *per se* under 35 U.S.C. section 112, second paragraph.

Moreover, applicants respectfully submit, contrary to the Examiner's assertion, that the term "supercritical solvent" (and by extension the term "supercritical-like solvent") is not a misnomer rendering the claimed invention indefinite. Rather, such term is a term of art used commonly to refer to a solvent in its supercritical state. For example, the McLaughlin reference (U.S. Patent No. 4,916,108), referred to by the Examiner, uses extensively the terms "supercritical solvent" (See, the Title, col. 1, line 11) "supercritical fluid" (throughout description) and "supercritical fluid solvent" (throughout description and claims) to refer to fluid "that is heated and pressurized above its critical temperature and pressure . . . ." (col. 3, lines 38-40).

Furthermore, a quick search of the U.S.P.T.O. database of the term "supercritical solvent" on November 19, 2003, retrieved over 200 issued patents that use such term. A review of the four most recently issued of these patents shows use of the term "supercritical solvent" in a manner consistent with the use of such term instantly. (See, for example, U.S. Pat. Nos. 6,649,776 (col. 3, line 28), 6,649,062 (column 2, lines 50-59), 6,646,135 (description of Fig. 2), and 6,638,574 (col. 1, line 53)).

In light of the clear definition in the instant specification, and the extensive disclosure in the art described above, those of skill in the art will readily be able to determine the meaning and scope of the terms "supercritical-like solvent" and "supercritical solvent". Such terms are thus definite under 35 U.S.C. section 112, second paragraph, and are used properly in the instant claims. Accordingly, the Examiner's rejections are improper and should be withdrawn.

#### **B. THE EXAMINER'S REJECTIONS TO CLAIM 13 REGARDING THE TERMS "TETRABIS" AND "ALUMOXANE" ARE TRAVERSED**

The Examiner rejected claim 13 under 35 U.S.C. section 112, second paragraph as being indefinite. In particular, the Examiner asserted "the proper term is--tetrakis-- not 'tetrabis', and in the third line insert --an-- before 'alumoxane' since this term refers to a genus of mixtures of compounds." (Office Action, page 4).

In response, while applicants believe claim 13 as filed met all requirements of 35 U.S.C. section 112, second paragraph, nevertheless, to expedite prosecution, applicants have amended claim 13 to recite "tetrakis" instead of "tetrabis" and to add the article "an" before the term "alumoxane." Accordingly, the Examiner's rejections are traversed and should be withdrawn.

**C. THE EXAMINER'S REJECTION WITH REGARD TO THE PHRASE "SAID POROUS SUPPORT" IS TRAVERSED.**

The Examiner rejected claims 14, 15, 20, 21, 38, and 39 under 35 U.S.C. section 112, second paragraph, asserting that the phrase "'said porous support' lacks antecedent basis since the superior claims only recite a 'support material' with no mention of porosity."

In response, while applicants believe claims 14, 15, 20, 21, 38, and 39 as filed met all requirements of 35 U.S.C. section 112, second paragraph, nevertheless, to expedite prosecution, applicants have deleted the term "porous" from the claims. Accordingly, the Examiner's rejections are traversed and should be withdrawn.

**D. THE PHRASE "A SELECTIVE SOLVENT FOR SAID SECOND ORGANIC CATALYST" IN CLAIM 22 IS DEFINITE**

The Examiner rejected claim 22 under 35 U.S.C. section 112, second paragraph, asserting:

it is not clear what is meant by "a selective solvent for said second organic catalyst"; is the solvent simply a better solvent for the second catalyst than the first? If so, then a more accurate term might be "solvent in which the second organic catalyst is more soluble than the first organic catalyst". *Id.*

In reply applicants respectfully submit that the term "selective solvent" is clearly defined on page 21 of the instant application to refer to "a solvent in which one organic catalyst or co-catalyst to be deposited on a support is relatively soluble and other catalysts or co-catalysts to be deposited on the support are relatively insoluble." In light of such definition, those of skill in the art would be readily able to understand the meaning and scope of the term "selective solvent for said second organic catalyst" to be a solvent in which the second catalyst is relatively soluble and other catalysts are relatively insoluble.

Furthermore, because the term "selective solvent" is clearly defined in the instant specification, it is definite under 35 U.S.C. section 112, and no further language (such as that along the lines of the language suggested by the Examiner) from the instant definition need be added to the claims. (As noted above, where the meaning of a term or phrase is clear from the teachings of the application itself, teachings in the prior art, and the general knowledge of those of skill in the art, such a term is definite under 35 U.S.C. section 112. (MPEP 2173.02, 2173.04)) Accordingly, in light of the clear definition in the instant application of the term

“selective solvent” and the teachings in the art, such term is clear and definite. Therefore, the Examiner’s rejection is improper and should be withdrawn.

**E. CLAIM 35 MEETS THE REQUIREMENTS OF 35 U.S.C. 112**

The Examiner rejected claim 35 under 35 U.S.C. section 112 stating:

again “supercritical solvent” is a misnomer since it is in fact a solvent in a supercritical state; it is not clear how evaporating the solvent in the supercritical state removes the first solvent unless the first solvent either azeotropes with the solvent in the supercritical state or the conditions of pressure and temperature are such that the first solvent also is volatile along with the solvent in the supercritical state; the element of causation appear to be lacking. It is also not clear how one contacts said first solvent only with the solvent in the supercritical state; it seems that the entire solution and support material must be contacted with the solvent in the supercritical state. (Office action, page 5).

In reply, applicants respectfully submit that the Examiner’s rejection is erroneous for a number of reasons. First, as indicated above, the term “supercritical solvent” is a well-known and common term of art used to describe a solvent in its supercritical state. In light of the prevalent use of such term in the art, such term is not indefinite and is properly used in the claim.

Furthermore, applicants submit that the step of “removing substantially all of said first solvent by contacting said first solvent with a supercritical solvent and evaporating said supercritical solvent” is a complete and clear description of a step of the claimed invention, and applicants are entitled to protection of any embodiment of such step supported by the specification and equivalents thereof without further recitation in the claim of how they are performed. A person of skill in the art would be readily able to determine if any given process includes: (a) removing a first solvent by (b) contacting the first solvent with a supercritical solvent and (c) evaporating the supercritical solvent, independent of how such step achieves removal on a molecular level. Therefore, the claim language is definite under 35 U.S.C.112, second paragraph. This conclusion is supported by the specification, for example on pages 19-20, wherein the removal of the first solvent is described as including selecting a supercritical solvent in which the first solvent is more soluble than the organic catalyst and contacting the first solvent with the supercritical solvent to remove the first solvent. The specification clearly describes for one of skill in the art how the removing step is conducted and accordingly such description is unnecessary in the claims.

Applicants are further unaware of any requirement under 35 U.S.C. section 112, second paragraph, regarding an “element of causation” needed to render claims definite. Rather, if those of skill in the art would readily comprehend the scope of, for example, a method step of a claim, such method step, and such claim is definite. *How* the method step is able to achieve results is irrelevant to 35 U.S.C. section 112, second paragraph. Accordingly, if the Examiner maintains the instant rejection, it is respectfully requested by applicants that the Examiner cite authority supporting such requirement for “causation” under 35 U.S.C. section 112, second paragraph.

Moreover, in reply to the Examiner’s assertion that “[i]t is also not clear how one contacts said first solvent only with the solvent in the supercritical state; it seems that the entire solution and support material must be contacted with the solvent in the supercritical state,” applicants respectfully submit that the Examiner is reading limitations into the claim that are not there. In particular, applicants note that claim 35 merely requires “contacting said first solvent with a supercritical solvent and evaporating said supercritical solvent.” There is no limitation in such claim that *only* the first solvent be contacted to the exclusion of the solution or support material. Accordingly, the Examiner’s assertion is erroneous.

In light of the above, applicants respectfully submit that one of skill in the art would readily be able to determine the scope of claim 35, thus, such claim is definite and patentable under 35 U.S.C. section 112, second paragraph. The Examiner’s rejection is erroneous and improper for each of the above reasons and should be withdrawn.

#### **F. THE EXAMINER’S OBJECTION TO THE TERM “ORGANIC” IS RENDERED MOOT**

The Examiner further asserted on page 5 of the outstanding Office Action that:

[t]hroughout the claims and specification, the term “organic” is used to modify “catalyst”, yet when the catalyst compound has a metal-carbon bond, as the metallocenes have, the proper term is “organometallic”. While applicant may be his or her own lexicographer, a term in a claim may not be given a meaning repugnant to the usual meaning of the term. . . . Hence “organic” appears to have been redefined in a manner inconsistent with conventional use by applicants.

In reply, applicant respectfully submit that the Examiner’s assertion that “organic” is redefined in a manner inconsistent with conventional use is incorrect. In particular, applicants note that the term “organic” is commonly used and defined to include a wide variety of compounds containing carbon *including* organometallics and metallocenes. For example, Hawley’s Condensed Chemical Dictionary, 12<sup>th</sup> edition, Richard J. Lewis Sr.

editor (1993) defines the term “organic chemistry” as “[a] major branch of chemistry” that embraces a variety of compounds of carbon including “IV. Organometallic compounds.” Moreover, those of skill in the art would readily recognize that the term organic is not exclusive of metallocenes and/or other organometallic compounds. Accordingly, applicants use of the term “organic catalyst” in the claims to refer to a catalyst of the claimed invention which may include, in preferred embodiments, a metallocene catalyst, is consistent with the common use of the term organic. Moreover, applicants note that the term “organic catalyst” has been defined in the instant specification (page 2) in a manner consistent with the common definition of organic. Such term is thus clearly definite and appropriate as used in the claims.

Nevertheless, to facilitate prosecution of the instant claims, applicants have amended the claims to recite a metallocene catalyst.<sup>1</sup> Accordingly, the Examiner’s rejection is mooted and should be withdrawn.

### **III. CLAIMS 1, 5-22 AND 35-39 MEET ALL THE REQUIREMENTS OF 35 U.S.C. SECTION 112, FIRST PARAGRAPH**

The Examiner rejected claims 1, 5-22, and 35-39 under 35 U.S.C. 112, first paragraph, as being too broad. More specifically, the Examiner stated the specification “while being enabling for the ‘organic’ catalyst being a metallocene, does not reasonably provide enablement for the catalyst being e.g. a nickel diimine compound, a Friedel-Crafts Lewis acid organic compound . . . which, of course, are generally organic.”

In reply, applicants respectfully submit that the claims as filed met all requirements of 35 U.S.C. 112, first paragraph, and that the Examiner has failed to provide the requisite scientific reasoning or rationale as to why any organic catalyst identified in the Examiner’s rejection would not work to produce a supported catalyst system pursuant to the teachings in the instant specification. The Examiner has merely listed several catalysts and asserted they are not enabled. Without further explanation, it is unclear to applicants why the Examiner feels that the identified organic catalysts are not enabled.

Nevertheless, in light of the amendments to the claims made herein, the Examiner’s rejection is rendered moot and should be withdrawn.

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<sup>1</sup> Applicant hereby reserve the right to prosecute any subject matter excluded via these amendments, including other “organic” catalysts in a related application.

#### **IV. SUMMARY OF THE INVENTION**

Claims 1 and 3-22, as amended, are directed to methods of producing a supported metallocene catalyst system comprising: providing a metallocene catalyst solution comprising a metallocene catalyst dissolved in a supercritical-like solvent; contacting a support material with the metallocene catalyst solution; and removing substantially all of the supercritical-like solvent from the metallocene catalyst and support material. Important to the claimed invention is the discovery by applicants that organic catalysts, especially, in certain embodiments, metallocene catalysts, are soluble and often very highly soluble in not only supercritical state, but also liquid state, supercritical-like solvents of the present invention. The relatively high solubility of organic/metallocene catalysts in the presently identified solvents allows a greater amount of catalyst to be introduced to a support to achieve a more evenly deposited catalyst support system than prior art methods for producing supported metallocene catalyst systems.

Claims 35-39 are further directed to methods of the present invention for producing supported catalyst systems using metallocene catalysts dissolved in solvents of the claimed invention.

#### **V. THE CLAIMED INVENTION IS PATENTABLE OVER THE EXAMINER'S CITED DOCUMENTS**

The Examiner rejected claims 1-22 and 35-39 under 35 U.S.C. 103(a) as being unpatentable over McLaughlin et al. (U.S. Pat. No. 4,916,108), in view of Hoel (U.S. Pat. No. 4,871,705), and Keller et al. (U.S. Pat. No. 5,744,556). More specifically, the Examiner stated on page 6 of the Office Action that:

McLaughlin discloses the use of supercritical state solvents to dissolve metal catalysts which are then impregnated into the pores of particulate or monolithic support materials, the supercritical solvent then being removed by either decreasing the ambient pressure or increasing the ambient temperature above the solution . . . .

The Examiner acknowledged, however, that "McLaughlin lacks disclosure that the catalyst may be an organic catalyst." (Page 7 of Office Action). Nevertheless, the Examiner asserted that Hoel "teaches that metallocenes with their cocatalysts are conventional organic catalysts which may be dissolved in solvents having boiling points close to room temperature. . . ." and that Keller "teaches specifically that metallocenes and their cocatalyst may be dissolved in supercritical state solvents . . . ." Accordingly, the Examiner concluded that:

[i]t would have been obvious to one of skill in the art to apply the teachings of Hoel and Keller to the disclosure of McLaughlin with a reasonable expectation of obtaining a



highly-useful method of making a supported catalyst with the expected benefit of the catalyst being evenly coated over the surface of the support material. (Office Action, page 7).

In reply, applicants respectfully submit that the Examiner's suggested combination of references fails to establish a *prima facie* case of obviousness and should be withdrawn.

McLaughlin is directed to methods of preparing a supported metal catalyst comprising dissolving a metal salt in an appropriate supercritical fluid solvent to form a solution, contacting a porous support with the solution, and changing either the temperature or pressure of the solution to change the supercritical solvent to a recoverable gas. McLaughlin teaches that for any given catalyst to be deposited on a support, it is imperative to select a supercritical solvent in which such catalyst is soluble, and McLaughlin further provides examples of suitable and unsuitable catalyst/solvent pairs. (Column 6, lines 7-60). However, as acknowledged by the Examiner, McLaughlin fails to teach or suggest the use of any organic catalysts, such as metallocene catalysts in the methods thereof. In addition, McLaughlin fails to teach or suggest that any supercritical-like solvents in their liquid or supercritical state are suitable for use with metallocenes to achieve a supported catalyst via the McLaughlin method, and also fails to provide motivation to use any liquid solvents at all for dissolving catalysts.

To the contrary, at least with regard to the use of liquid-state solvents, those of skill in the art would clearly be motivated *against* the use of a liquid supercritical-like solvent in the process of McLaughlin because to do so would require ignoring essentially all of the key teachings of McLaughlin. Throughout its disclosure, McLaughlin emphasizes the advantages of using supercritical solvents in its disclosed method over liquid-state solvents. In particular, McLaughlin asserts that supercritical solvents are used in the disclosed methods to ease removal of the solvents from contacted supports without the need for time-consuming and/or costly drying steps used conventionally to remove non-supercritical *liquid* solvents, such as water. (Column 7, lines 32-55). At column 5, lines 44-60, McLaughlin emphasizes that the "physical properties, such as, for example, surface tension and viscosity, of a gas or liquid change drastically as the critical point is approached . . . ." and that because of such phenomena, the McLaughlin methods are able to use solvents in their *supercritical state*, instead of liquids such as water, to provide a catalyst support "resulting in greater contact of the surface area and improved adsorption of the dissolved metal on the surfaces of the support, which results in greater catalytic activity." Furthermore, at column 5, lines 3-34, McLaughlin makes clear that the solubility of a catalyst in a particular solvent decreases dramatically (and unfavorably for the purposes of McLaughlin) as the solvent conditions are changed from

supercritical conditions to liquid conditions. Accordingly, in light of such clear teachings, those of skill in the art would not be motivated to use any liquid solvents, such as the solvents taught of Hoel, in McLaughlin, but rather, would be motivated away from such a modification of McLaughlin.

Therefore, although the Examiner has asserted that Hoel teaches the use of certain liquid solvents in which metallocenes are soluble (an assertion with which applicants do not necessarily agree), one of skill in the art would have no motivation to incorporate any combinations of metallocenes and liquid solvents of Hoel with the McLaughlin reference to achieve a method of the present invention. Rather, even if Hoel teaches the solubility of certain metallocenes in certain liquid solvents, those of skill would be motivated against modifying McLaughlin to include such metallocene/liquid solvent combinations in view of the teachings in McLaughlin discouraging the use of liquid solvents. Therefore, the Examiner's suggested combination is improper and the rejection should be withdrawn.

Those of skill in the art would likewise be motivated against modifying the teachings of McLaughlin to incorporate the catalyst/solvent combinations in Keller, because the only catalysts taught by Keller to be soluble in the Keller compressed/supercritical fluids are *solvent-borne* catalysts, that is, solutions/suspensions of solid catalysts in non-supercritical/liquid solvents. Keller is directed to methods for the gas-phase polymerization of polymers using an unsupported catalyst system comprising (i) a non-volatile materials fraction containing a catalyst; (ii) a solvent which is at least partially miscible with the non-volatile material fraction, and (iii) a compressed fluid, which is preferably a supercritical fluid. Keller teaches that the catalyst system for use therein is produced by first dissolving the catalyst in a *liquid* solvent, such as isopentane, hexanes, and octanes, to form a solvent-borne composition (see column 4, lines 8-21, 62-67, and column 5, lines 1-5). The solvent-borne catalyst is then dissolved in a compressed fluid for use in Keller (column 5, lines 25-29). With regard to metallocenes, Keller notes in particular that such catalysts are preferably dissolved in relatively high-boiling liquid solvents, such as toluene and isopentane, to form solvent-borne catalyst compositions which are subsequently soluble in compressed ethane or propane. (column 7, lines 1-11).

However, as noted above, those of skill in the art would be highly motivated to avoid the use of any non-supercritical/liquid solvents in the process of McLaughlin in light of the clear teachings therein of the disadvantages associated with such solvents. Accordingly, those of skill in the art would not be motivated to modify McLaughlin to use therein the solvent-borne catalysts of Keller which necessarily comprise non-supercritical/liquid fluids.

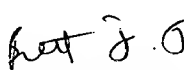
Additionally, Keller provides no teaching or suggestion that non-solvent-borne catalyst compositions are suitable for use with, or soluble in, the compressed/supercritical solvents disclosed therein. Accordingly, one of skill in the art is provided no motivation or reasonable likelihood of success in light of Keller to modify McLaughlin to include non-solvent-borne catalysts to achieve a method of the claimed invention. Therefore, in light of the above, the Examiner's rejection is improper and should be withdrawn.

## VI. CONCLUSION

Reconsideration is respectfully requested. In view of the above amendments and remarks, it is urged that the present application be allowed. An early and favorable response is earnestly solicited.

Respectfully submitted

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